# Analysis of Net Interstate Migration: Comment

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I.

In a recent issue of this journal, Sommers and Suits [8] attempt to analyze the determinants of net interstate migration according to race (white or black) over the 1950–1960 and 1960–1970 periods. This paper has two objectives: a) to point out certain basic shortcomings in their analysis and b) to offer an alternative framework for the analysis of net interstate migration.

II.

Sommers and Suits [8, 103] introduce the following regression equation:

$$M = a + b_1 Y + b_2 U + b_3 W + \sum_{i=1}^{\infty} c_i R_i, \quad (1)$$

where $M$ = net migration by race into (+) or out of (−) a state expressed as a percentage of the state's population at the beginning of the period.

$Y$ = mean per capita income for each state expressed as a percentage of the U. S. average for each period.

$U$ = mean unemployment rate for each state for each decade.

$W$ = average monthly AFDC payment per family for each state for each period and the $R_i$ are eight dummy variables employed to capture the regional pattern of net migration that emerges after economic factors have been taken into account.

There are at least two major deficiencies in the structure of this model. To begin with, the income variable ($Y$) measures *total* per capita income. However, since the authors stress migration patterns by race, a more appropriate procedure would be to specify income by race as well. Thus, the regression estimates for white (black) migrants would relate white (black) net migration to white (black) per capita incomes. Given the enormous interstate disparities between white per capita incomes and black per capita incomes (see [9]), and given that a number of authors have found major differences as between the responsiveness of whites and blacks to income differentials (see Bowles [1], Kohn, Vedder, and Cebula [5], and Pack [7]), this change in approach would seem both relevant and significant. Next, for much the same reasons, their unemployment variable should be broken down according to race. As shown in Kohn, Vedder, and Cebula [5], Pack [7], and elsewhere, it makes little sense here (as above) to regress each race's migration rates against the *total* unemployment rate for both races combined.

Another important deficiency in the analysis of Sommers and Suits concerns their discussion of the welfare variable and its impact on migration according to race. Table I [8, 195] shows the empirical impact of the welfare variable on racial and on total net migration. Sommers and Suits fail to acknowledge and analyze what in fact is a highly significant difference in the response of whites and blacks to this variable. On the one hand, blacks were weakly attracted by higher welfare benefits, while whites, on the other hand, were significantly repulsed by higher welfare benefits. In point of fact, the latter impact was so potent that it substantially outweighed the responsiveness of blacks. In view of other studies (see Pack [7] or Kohn, Vedder, and Cebula [5]), the authors should have anticipated this result and at least attempted to provide an *a priori* explanation thereof.

Aside from this, one must wonder to what extent the use of total per capita income (in lieu of income by race) may have distorted the apparent impact of the welfare variable on migration. As evidence of this problem, we observe (according to their data) a zero-

order correlation coefficient in excess of 0.6 between *total* per capita income and welfare benefits.

III.

In order to correct for the above-mentioned deficiencies in their analysis, the following model of net migration is offered:

$$Mi = Mi(Yi, Ui, Wi, Pi, Ti), \quad (2)$$

where $Mi$ is a measure of net interstate migration (in-migration less out-migration) to state $i$, $Yi$ is a measure of per capita income in state $i$, $Ui$ is the unemployment rate in state $i$, $Wi$ is a measure of the average payment to welfare recipients in state $i$, $Pi$ is a measure of air pollution in state $i$, and $Ti$ is a measure of cold weather in state $i$.

The variable $Mi$ is used to measure the migration of whites on the one hand and of blacks on the other hand. $Mi$ is defined as the ratio of the net migration of whites or blacks to state $i$ between 1960 and 1970 to the total population of state $i$ in 1960. $Mi$ is thus defined so as to control for variations in the population among the states considered. This formulation is the same as adopted by Sommers and Suits [8, 193]. The migration data were assembled for 48 states (Hawaii and Alaska were excluded) from the *Statistical Abstract of the United States, 1973* [13, Table 29] and from the *Statistical Abstract of the United States, 1968* [12, Table 28].

The variable $Yi$ refers to the per capita personal income level of whites or blacks for the year 1960 expressed as a percentage of the U. S. average income per capita in 1960. These data were obtained from the 1960 Census of the Population [9, Table 67]. In accord with conventional economic theory, it is assumed that white and black migration should each be directly related to white income and black income, respectively, so that:

$$\partial Mi/\partial Yi > 0. \quad (3)$$

The variable $Ui$ measures the unemployment rate for whites on the one hand and for blacks on the other hand. The variable $Ui$ was obtained by averaging the 1960 and 1970 unemployment rates for whites and for blacks. The data were obtained from the 1960 Census of the Population [9, Table 115] and the 1970 Census of the Population [10, Table 115]. This is similar to the formulation in Sommers and Suits except that we averaged $Ui$ along racial lines. The expected relationship between migration (white or black) and the unemployment rate is:

$$\partial Mi/\partial Ui < 0. \quad (4)$$

The reasoning here is quite simple. In particular, for those whose movement between states is not of the job-transfer variety, the higher the unemployment rate in a state, the greater the uncertainty (risk) associated with obtaining employment in that state.

To measure welfare benefits, $Wi$, data on monthly payments in the year 1971 to welfare recipients in the form of aid to dependent children by state were gathered. The source of the data was the *Statistical Abstract of the United States, 1973* [13, Table 490]. A much larger proportion of blacks than of whites is eligible for welfare benefits. Consequently, it may be expected that the level of welfare benefits will act as a stronger attraction to black would-be migrants than to their white counterparts. In addition, by virtue of the fact that welfare benefits represent a redistribution of income from the economically better-off to the economically worse-off, whites may tend to view areas with higher welfare benefits as areas which on average redistribute income from themselves to others. Thus, *ceteris paribus*, the would-be white migrants may be expected to gravitate to areas with lower levels of welfare benefits. The following is postulated:

$$\partial Mi/\partial Wi > 0 \quad \text{for black migrants} \quad (5A)$$

and

$$\partial Mi/\partial Wi < 0 \quad \text{for white migrants.} \quad (5B)$$

To measure air pollution, $Pi$, data were assembled measuring suspended particulate

matter by state for the year 1966.[1] The data were obtained from the *Statistical Abstract of the United States, 1968* [12, Table 262]. Presumably, higher pollution rates impose greater disutility on individuals in terms of general health and discomfort than do lower pollution rates, *ceteris paribus*. Thus, the following relationship would be expected for both whites and blacks:

$$\partial Mi/\partial Pi < 0. \tag{6}$$

Supposedly, a majority of the population prefers mild or warm climates to cold climates, *ceteris paribus*. Blacks, however, tend to migrate from the South, i.e., from warm states, to the Northeast Region, the North Central Region, and to states in the West (see *Statistical Abstract of the United States, 1973* [13, Table 29]). This may in part be attributable to discrimination expectations. In any event, it is hypothesized here that:

$$\partial Mi/\partial Ti < 0 \quad \text{for white migrants} \tag{7A}$$

and

$$\partial Mi/\partial Ti > 0 \quad \text{for black migrants.} \tag{7B}$$

Given the above, we propose to estimate the following regression equation for white migrants and for black migrants:

$$Mi = a + b_1 Yi + b_2 Ui + b_3 Wi + b_4 Pi + b_5 Ti + \mu, \tag{8}$$

where $a$ is a constant and $\mu$ is a stochastic error term.

The empirical results are given for white migrants and black migrants by equations (9) and (10), respectively:

$$\begin{aligned} \text{Mi} = &- 5{,}70117 + \underset{(3.41)}{0.44215}\ \text{Yi} \\ &- \underset{(0.86)}{0.11707}\ \text{Ui} - \underset{(2.94)}{0.16048}\ \text{Wi} \\ &- \underset{(1.64)}{0.08623}\ \text{Pi} - \underset{(1.69)}{0.05043}\ \text{Ti}, \\ &\text{DF} = 42,\ \text{R}^2 = 0.58, \end{aligned} \tag{9}$$

and

$$\begin{aligned} \text{Mi} = &- 8.60812 + \underset{(0.89)}{0.08562}\ \text{Yi} \\ &- \underset{(1.10)}{0.14645}\ \text{Ui} + \underset{(2.55)}{0.40661}\ \text{Wi} \\ &+ \underset{(0.06)}{0.02434}\ \text{Pi} + \underset{(1.43)}{0.18501}\ \text{Ti}, \\ &\text{DF} = 42,\ \text{R}^2 = 0.66, \end{aligned} \tag{10}$$

where the terms in parentheses are $t$-values.

We first analyze the white migration results in (9). The income variable worked as hypothesized and was statistically significant at the one percent level, thus confirming the "conventional wisdom." [2] This result is consistent with Sommers and Suits [8, Table I, 195] for the 1960–1970 period. The unemployment variable was likewise of the correct sign, but not statistically significant at the ten percent level. This is in contrast to Sommers and Suits, who found unemployment rates to be significant at nearly the five percent level. The welfare variable turned up with the hypothesized negative coefficient and was significant at the one percent level.[3] This is in agreement with Sommers and Suits. The pollution ($Pi$) and climate ($Ti$) variables both had the hypothesized negative signs and were statistically significant at about the five percent level. This pollution result is in contrast to Cebula and Vedder [2], who found *total* migration insensitive to pollution levels, while the climate result is consistent with the study by Greenwood [4] and those by Gallaway and Cebula [3] and Cebula and Vedder [2].[4] Finally, the $R^2$ was 0.58, so that the model explained nearly three-fifths of the net white interstate migration.

In regression (10), black migrants are shown to be relatively insensitive to income differentials, a finding consistent with recent

[1] Suspended particulate matter consists of "... particles of smoke, dust, and fumes and droplets of viscous, viscous liquid remaining in the air for varying periods of time ..." [12, 174].

[2] This is consistent with Bowles [1], Greenwood [4], and Vedder and Gallaway [14].

[3] This is consistent with Kohn, Vedder, and Cebula [5] and Pack [7].

[4] Related to the climate variable, see Miller [6, 403].

studies by Pack [7] and Kohn, Vedder, and Cebula [5], but at odds with the results by Sommers and Suits. The unemployment rate was not a significant factor in black migration decisions. This confirms the results found by Sommers and Suits. The welfare variable was found to be statistically significant with the hypothesized positive sign at the one percent level. This contrasts to their findings, where welfare acted as a very weak attractive force to black migrants. On the other hand, our findings are quite compatible with Pack [7] and Kohn, Vedder, and Cebula [5]. The pollution variable had a positive sign but was not statistically significant. The positive value for this coefficient contradicted our argument in (6), but the statistical insignificance is in conformity with Cebula and Vedder [2]. The climate coefficient had the correct (positive) sign and was statistically significant at the ten percent level. Finally, the value for the $R^2$ was 0.66. Hence, the present model had even greater explanatory than did the model for white migration.

## IV.

By respecifying the variables in the migration model, we have obtained results vastly different from those of Sommers and Suits, especially in terms of black migrants. Whereas our findings on white migrants differed materially only with respect to one variable, unemployment, our results differed markedly from theirs with respect to black migrants for two variables, income and welfare. Moreover, in contrast to them, a viable hypothesis for the behavior of the welfare variable in both equations was offered. It appears that the model and analysis of Sommers and Suits would benefit materially from a revision such as suggested here.

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